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II.

PRELIMINARY NOTES ON THE SPECIES OF
DOASSANSIA, CORNU.

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Presented March 11, 1891.

THE genus *Doassansia* was established by Cornu, in 1883,* to receive the *Sclerotium Alismatis*, Nees, on *Alisma*, and a new species, *D. Farlowii*, on *Potamogeton*. Since then there have been several additions both of old and of new forms, until at present the number of species referred to it is twelve. All of them inhabit hosts which are more or less aquatic in habit, though belonging to widely separated families. They are said to differ little in structure, but to be distinguished from one another chiefly by the differences of the host plant.† A careful study of the species distributed in the various "Exsiccati," as well as of the accessible living material, has shown that this is not strictly correct. Not only are most of the species fairly well characterized by peculiarities of structure, but there are also several types of structure sufficiently diverse to be given sub-generic or even generic rank. Moreover, by the discovery of several new species, additional types of structure have been found, and have rendered it even more necessary that a careful revision of all the species should be made. On this account, full descriptions and figures of all the species of which material was available have been prepared, but as there is a delay in publication, it has seemed best to give a brief summary of the results in the present preliminary notice.

The spores of the *Doassansiæ* resemble those of the species of *Entyloma* both in structure and in germination; but in the former they are collected and compacted into balls, called by most writers "sori." The species of the genus *Doassansia* have in addition a coat, or "cortex," of sterile cells surrounding the sorus. Cornu certainly

* Ann. Sci. Nat., ser. 6, Tom. XV. p. 285.

† Cf. Schroeter, Pilzf. Schles., p. 286, 1887. De Toni, Journ. Myc., Vol. IV. p. 14, 1888.

considered that the possession of this cortex was the distinguishing feature of the species of his genus, although, as will be noted under *D. Farlowii*, he did not always recognize the true cortex. It seems best, therefore, to refer to *Doassansia* all the species of the group of the *Entylomata* which have the sorus invested with a cortex of sterile cells.

The sori of several species referred to *Doassansia* show, when thin sections are examined, that this cortex is not present. Such are the sori of *D. Niesslii*, De Toni, *D. Limosellæ*, (Kunze), Schroeter, *D. decipiens*, Winter, and an undescribed form on *Echinodorus rostratus*, mentioned by Harkness under *D. Alismatis*.* These several species, together with *Entyloma crastophilum*, Sacc., and probably others, form a group intermediate between the simpler species of *Entyloma* and those of *Doassansia* proper; but the limits of this group cannot be ascertained with any exactness without a careful study of all the numerous forms which of late have been referred as species to *Entyloma*. They must therefore be left unsettled in position for the present.

Among the *Doassansia*, as is the case among the *Entylomata* in general, the specific distinctions are not striking. They differ slightly in habit when dried, yet when fresh most of the species may be distinguished at a glance by the peculiar distortion or discoloration of the host plant produced by them. As a rule, the *Entylomata* do not produce distortions, but two of the species of *Doassansia* cause swellings of considerable size. The structure of the sorus varies decidedly, and has been made in these notes the basis of generic and subgeneric distinctions. The germination has been obtained wherever possible, and has been found to vary in its details among the different species.

Following is given the arrangement of the species and genera.

DOASSANSIA, CORNU.

Spores resembling those of *Entyloma* both in structure and in germination, collected and compacted into sori. Cortex of sterile cells present.

SUBGENUS I. EUDOASSANSIA.

Body of the sorus consisting entirely of spores, which are readily separable from one another at maturity.

* Cf. Proc. Cal. Acad. Sci., ser. 2, Vol. II. p. 231, 1889.

The type of this subgenus is *D. Alismatis*, Cornu, which represents Cornu's idea of *Doassansia*.

1. *D. Epilobii*, Farlow.

On leaves of *Epilobium alpinum*.

United States!

The cells of the cortex of this species are very small and flattened, and the sori, on this account, very closely resemble those of *D. decipiens*, Winter. It may perhaps be looked upon as a form intermediate between the group represented by *D. decipiens* and the group of the *Eudoassansiæ*.

2. *D. Hottoniæ*, (Rostr.), De Toni.

On leaves of *Hottonia palustris*.

Denmark!, Germany!, France!.

3. *D. Sagittariæ*, (Westend.), Fisch.

On leaves of *Sagittaria sagittifolia*, *graminea*, *variabilis*, and *Montevidensis*.

Italy!, France!, Germany!, Belgium!, England!; Argentine Republic; Canada!, United States!.

4. *D. opaca*, sp. nov. Spot orbicular, slightly swollen on both surfaces of the leaf, lemon-yellow, at length dark brown and opaque. Sori crowded, indistinct when viewed with a lens, globular to almost cubical, 200–300 μ by 80–100 μ , light brown. Spores rather loosely compacted together, nearly spherical, 10–15 μ in diameter. Cortical cells of various shapes, from brick-shaped to almost cubical. Germination unknown.

On leaves of *Sagittaria variabilis*.

United States! (Newton, Mass., *W. G. Farlow*!, Medford, Mass.!, Norwich, Conn.!).

This species was mentioned by Farlow* under the name of *Protonyces Sagittariæ*, as occurring at Newton, Mass. The same form has been collected by myself, both at Medford, Mass., and at Norwich, Conn., in abundance, and has been studied in all stages of development. The species differs decidedly from *D. Sagittariæ* in habit and form of the sorus, as well as in the character of the cortical cells. Sowings of the spores have been repeatedly made, but the germination, unfortunately, has not been obtained. The species is readily detected by holding an infected leaf between the eye and

* Bot. Gaz., Vol. VIII. p. 276, August, 1883.

the light, when the spots appear as dark, black patches in the leaf substance.

5. *D. Alismatis*, (Nees), Cornu.

On leaves of *Alisma natans* and *Plantago*.

Italy!, France, Germany!, Finland!, England!; Siberia!; United States!.

SUBGENUS II. PSEUDODOASSANSIA.

Central portion of the sorus composed of an irregular-shaped mass of fine, densely interwoven hyphæ. Spores in several layers, loosely compacted together. Cortex of large, well differentiated cells.

6. *D. obscura*, sp. nov. Spot none. Sori in lines in the larger intercellular spaces at the base of the petioles and peduncles of the host, globular to ellipsoidal, 180–220 μ by 200–300 μ , light brown. Spores almost globular, 8–12 μ in diameter, light-colored. Cortical cells obversely conical, conspicuously lobed at the outer, broader end. Promycelium narrowly cylindrical, about 20 μ long. Sporidia in whorls of 5 to 7, elongated fusiform, 16–17 μ long and 1.5–2 μ thick, producing bunches of secondary sporidia without conjugation.

On petioles and peduncles of *Sagittaria variabilis*.

United States! (Cambridge, Mass.!, Medford, Mass.!, Norwich, Conn.!).

This species is very inconspicuous, being detected only upon the most careful examination. When occurring upon the green portions of the petioles and peduncles, it causes a very faint yellowish discoloration. It most frequently inhabits the white portions at the very base of these parts, and then the dark lines of sori show through the more or less transparent outer tissues. It is abundantly distinct from all the other species of the genus. The central hyphæ, the loosely compacted spores, the obconic lobed cells of the cortex, and the method of germination of the spores, are all characteristic. It seems to differ so much from the species which cluster about *D. Alismatis* as to demand a special subgenus for its reception.

SUBGENUS III. DOASSANSIOPSIS.

Sorus compact, not separating into its component elements at maturity. Central portion consisting of a compact mass of parenchymatous tissue. Spores in a single layer. Cortex of small flattened cells.

7. *D. occulta*, (Hoffm.).

D. occulta, (Hoffm.), var. *Farlowii*, (Cornu).

Authentic specimens of *D. Farlowii*, Cornu, do not seem to me to correspond exactly to Hoffmann's figures,* but differ particularly in having spores which are elongated in a radial direction. Specimens collected by myself near Norwich, Conn., agree better with Hoffmann's figure, and are considered in these notes to represent the type of *D. occulta*, while *D. Farlowii* is for the present placed as a variety under it. The elongated cells on the periphery of the sorus in Cornu's figure † are really the spores, and the real cortex of small, radially flattened cells is not shown, while the rounded cells in the centre are not immature spores, but are sterile cells resembling parenchyma cells.

In the ovaries of species of *Potamogeton*.

Type. Germany; United States! (Norwich, Conn.!).

Var *Farlowii*. Canada (Ottawa, *J. B. Fletcher*!).

8. *D. Martianoffiana*, (Thuem.), Schroeter.

On leaves of species of *Potamogeton*.

Siberia; Germany, Sweden!; Canada!.

In the specimens from Sweden, distributed by Johanson, ‡ there appear to be conidia, almost identical in appearance with those already known in some species of *Entyloma*. There seems to be an intimate connection between the mycelium of the *Doassansia* and that of the conidia.

9. *D. deformans*, sp. nov. Species forming distortions, often of large size, on all parts of the host. Sori globular, 100–140 μ , very light brown. Spores polyhedral, 8–10 μ by 4–8 μ . Cortical cells polygonal, flattened radially. Promycelium somewhat obconical, about 12 μ long. Sporidia 5 to 6, broadly fusiform, 12 μ by 4–5 μ , conjugating and producing a short germ tube.

In the leaves, petioles, peduncles, pedicels, and ovaries of *Sagittaria variabilis*.

United States! (Norwich, Conn.!, Cambridge, Mass.!) ; Canada (London, leg. *Dearness*, comm. *J. B. Ellis*).

A species forming large distortions on *Sagittaria*, nearly related to the other species of the subgenus, but abundantly distinct from all the

* Ic. Anat. Fung., Taf. XVI. Fig. 3, 1862.

† Ann. Sci. Nat., Tom. XV. Pl. XVI. Fig. 6, 1883.

‡ Cf. Eriksson, Fung. Scand. Par., No. 264, 1888. Pazschke, Fung. Eur., No. 3602, 1890.

other species on the same host. It is to be distinguished from *D. occulta* (type) by its method of germination. It is without doubt more widely spread, but the distortion is probably mistaken for the work of an insect rather than that of a fungus.

Species Inquirendæ.

10. *D. Comari*, (B. & Br.), De Toni.

On leaves of *Comarum palustre*.

England.

11. *D. punctiformis*, Winter.

On leaves of *Lythrum hyssopifolium*.

Australia.

12. *D. Lythropsidis*, Lagerh.

On *Lythropsis peploides*.

Portugal.

Species Excludendæ.

D. Niesslii, De Toni.

D. Limosellæ, (Kunze), Schroeter.

D. decipiens, Winter.

D. Alismatis, Hark. (not Cornu).

BURRILLIA, gen. nov.

Sorus compact, not separating into its elements on being crushed. Central portion composed of an irregular mass of parenchymatous tissue. Spores closely resembling those of *Entyloma*, both in structure and in germination, compacted into several dense rows. Cortex none or composed only of a thin, irregular layer of hardened hyphæ.

B. pustulata, sp. nov. Spots irregularly orbicular, often confluent, light yellow, chiefly hypophyllous. Sori elongated ellipsoidal, at length bursting through the epidermis, which appears raised in small blisters, 200–350 μ by 150–180 μ , light brown. Spores not separable at maturity, almost globular, 4–6 μ in diameter, germinating while the sori are in position. Promycelium cylindrical, 15 μ long, bearing 4–5 sporidia in a whorl at the blunt apex. Sporidia slightly bent, 16 μ by 3 μ .

On leaves of *Sagittaria variabilis*.

United States! (Illinois, leg. G. P. Clinton!, comm. T. J. Burrill, Wisconsin, W. Trelease!).

The sori of this species resemble in structure the spore balls of *Testicularia Cyperi*, Klotzsch.;* but the position of that species is un-

* Cf. Cornu, Ann. Sci. Nat., ser. 6, Tom. XV. pp. 270–273, Pl. XIV. Fig. 1–5, 1883.

certain, and even if it is one of the *Ustilagineæ* at all, it belongs rather to the series of the pulverulent smuts, while the present form, both in spore structure and in germination, is closely related to *Doassansia* and to *Entyloma*. It is to be distinguished from any of the species of *Doassansia* by the lack of a cortex, and from any of the other *Entylomata* by the presence of the central parenchymatous portion. In the latter, it resembles the forms described under the subgenus *Doassansiopsis*, but it differs from them not only in the lack of a cortex but also in the possession of several layers of spores. The genus is named in honor of Prof. T. J. Burrill, of the University of Illinois, by whom the first specimens were sent.

CORNUELLA, gen. nov.

Sorus hollow at maturity, the interior containing only loose, hardened hyphæ. Spores compacted into a firm layer on the outside, resembling those of *Entyloma* both in structure and in germination. Cortex none.

C. Lemnæ, sp. nov. Spot none. Sori globular to ellipsoidal, 50–70–100 μ in diameter, dark brown. Spores not separable at maturity, often elongated radially, 10–12 μ by 6–10 μ . Promycelium somewhat obconical. Sporidia in whorls of 5 to 7, narrowly fusiform, 26 μ by 2 μ , producing a germ tube after conjugating.

In the fronds of *Lemna* (*Spirodela*) *polyrrhiza*.

United States! (Cambridge, Mass.!, Newton, Mass.!!; Belchertown, Mass., *J. E. Humphrey*!).

The type of this genus, which I respectfully dedicate to Prof. Maxime Cornu, of the Jardin des Plantes, is very different from any described member of the *Ustilagineæ*. The hollow sorus with only loosely entangled hyphæ on the inside, is unique, and yet the spore structure and germination closely ally it with *Doassansia* and *Burrillia*.

The germination takes place while the spores are in position, and the whole sorus is covered with a bristly mass of promycelia and sporidia. Something of the same thing happens also in *Burrillia pustulata* and in the species of the subgenus *Doassansiopsis*.